NISTTech

Flexible Memory Devices

Inexpensive, re-writeable memory

Description

This invention is a novel electronic memory device designed and fabricated on inexpensive flexible plastic substrates that can be written, erased, and re-written. Flexible electronics is an emerging industry with the potential to revolutionize inexpensive portable electronics. The NIST memory device combines simplified room temperature fabrication and non-volatile low operation voltage thus making it very promising for applications using flexible, rewritable memory.

One example of a possible application for the new device is as memory for a disposable sensor. A flexible strip containing sensors and electronics could be worn by a person to monitor things like heart rate or blood sugar. Vital information would be collected by the sensors, temporarily stored by the flexible memory then transferred to a long term storage device. Radio-frequency identification (RFID) solutions could likewise incorporate this memory platform into products to store inventory data.

NIST scientists fabricated the flexible memory device using existing sol gel technologies and room-temperature solution processing techniques to create a two-terminal device using titanium dioxide as the memory element. This device shows a non-volatile memory behavior with on/off ratios up to 1,000:1, which can be cycled between write, read, and erase states by applying voltages with magnitudes of less that 10 Volts.

Images

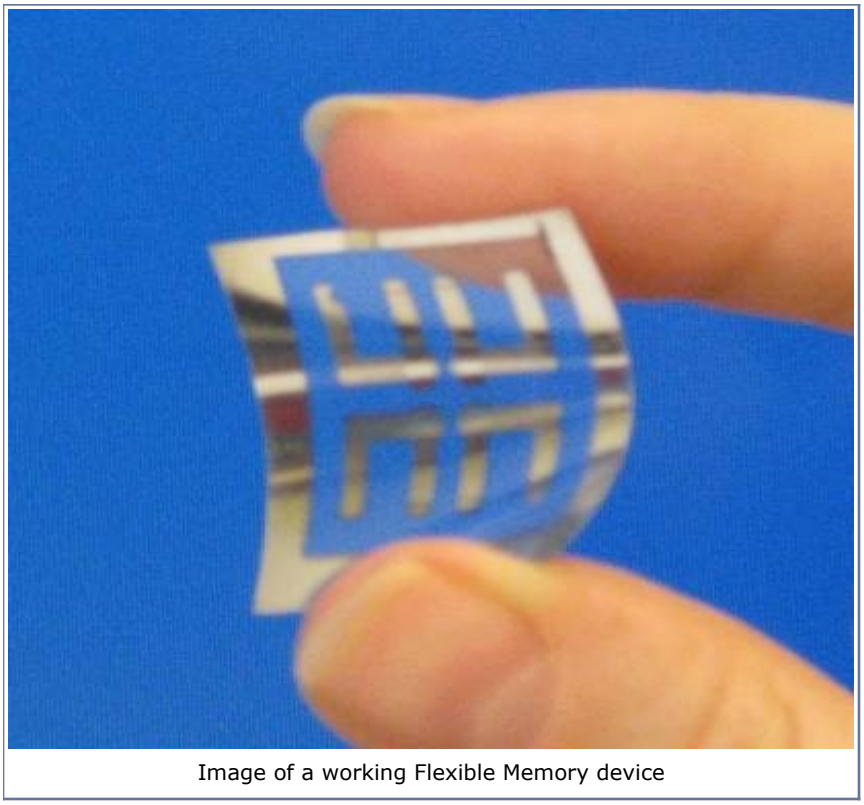

Image of a working Flexible Memory device

Applications

- **Sensors**
  Flexible Memory devices could be used in the monitoring of vital signs and other bodily statistics such as blood sugar
- **Inventory data collection**
  When teamed with radio frequency identification systems (RFID), Flexible Memory perform inventories in stockrooms and warehouses

Advantages

- **Inexpensive and feather-light**
  Low cost, weight and power requirements

- **Low-tech manufacturing conditions**
  Flexible Memory devices can be built at room temperature and at standard pressure levels thus reducing fabrication costs
- **Write, erase, reuse**
  Each Flexible Memory chip can be recycled many times even for different applications

Abstract

We report the fabrication and characterization of a two-terminal rewriteable nonvolatile flexible memory device that consists of a titanium dioxide layer, formed by using a room-temperature processed sol gel, with aluminum contacts on an inexpensive commercially-available flexible polymer sheet (an overhead transparency). This device shows a nonvolatile memory behavior with on/off ratios up to 1000:1, which can be cycled between write, read, and erase states by applying voltages with magnitudes of less than 10 V. The devices have the potential to meet the needs of flexible, rewritable memory while providing the advantages of simplified room temperature fabrication and relatively low drive voltage operation.

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Citations

1. N. Gergel-Hackett, B. Hamadani, B. Dunlap, J. Suehle, C. Richter, C. Hacker, D. Gundlach. A flexible solution-processed memristor. IEEE Electron Device Letters, Vol. 30, No. 7. 2009.

Related Items

- Informational Video: Flexible Memory
- Article: NIST Develops a Flexible Memristor

References

- U.S. Patent 9,048,414
- Docket: 08-008

Status of Availability

This invention is available for licensing exclusively or non-exclusively in any field of use.

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